# RadBench : benchmarking image interpretation skills on a global scale

WRIGHT, Chris

Sheffield Hallam University

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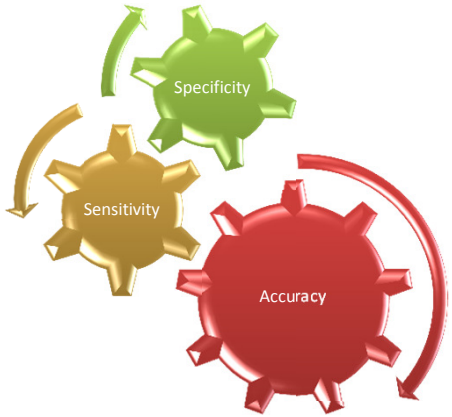


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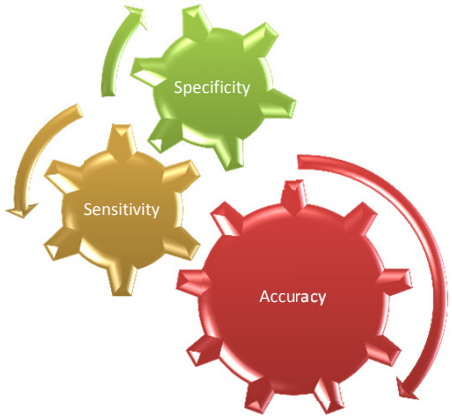
## Research Question

# Can image interpretation skills be benchmarked on a large (global) scale?

whilst providing the granularity to see microscopic influences



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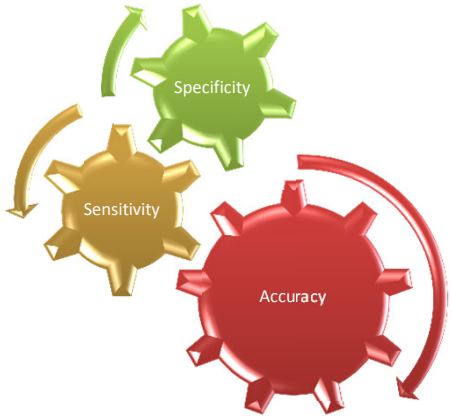
# Session Outline

- Overview of the RadBench product
- Present some early results & findings
- Consider applications and implications for practice and learning

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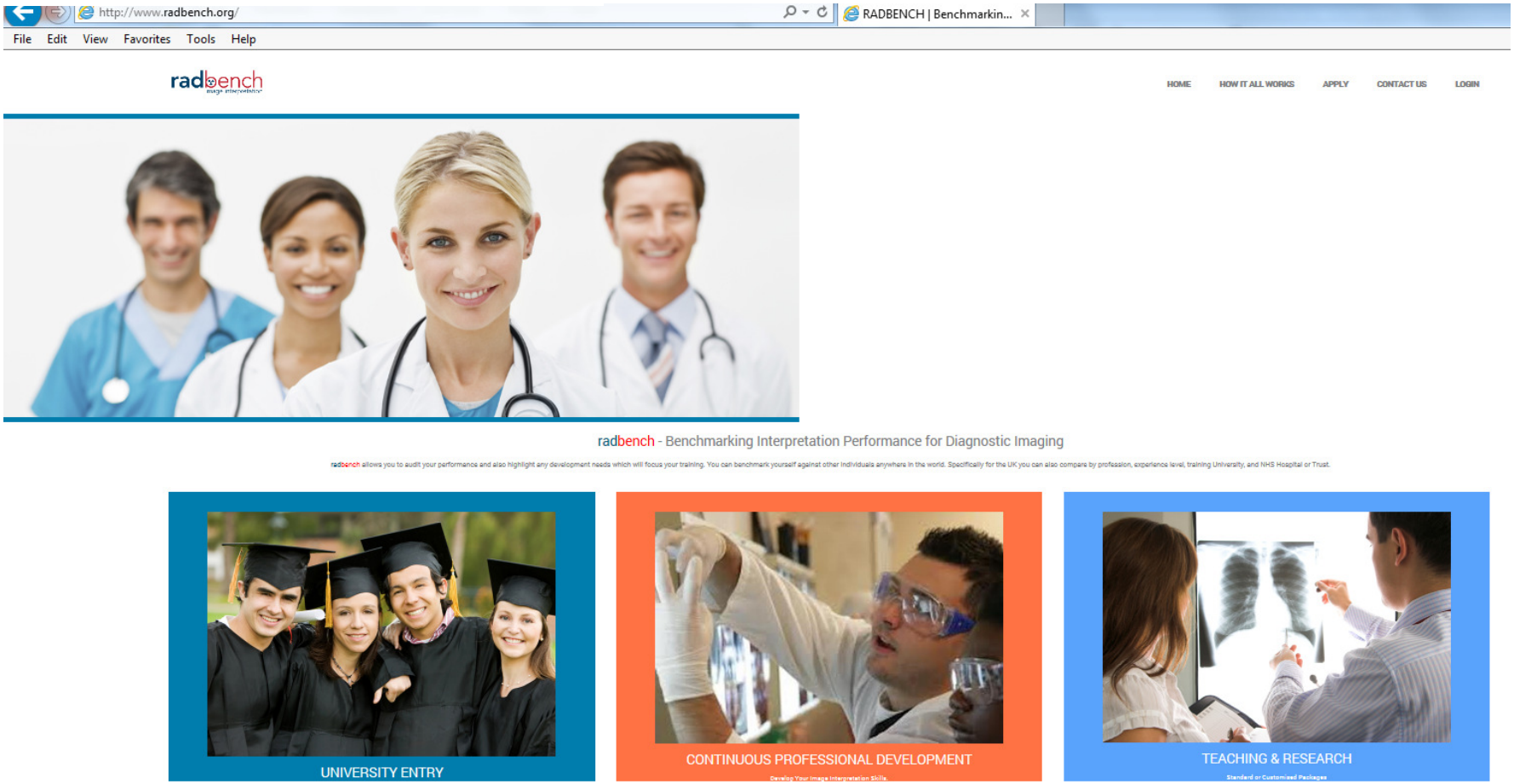
www.radbench.org



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# On-Line Registration

- Users are assigned a unique ID and password via e-mail after agreeing to terms and conditions of use and ethical code
- Performance and certification is personal to the user
- Users have full control of their personal details and can update them as required
- User cannot be identified from the benchmarking/research data bank
- Test results cannot be changed.
- RadBench (Papaya UK) can provide consultancy support to organisations wishing to integrate this approach and develop their staff and optimise their return on investment (ROI).

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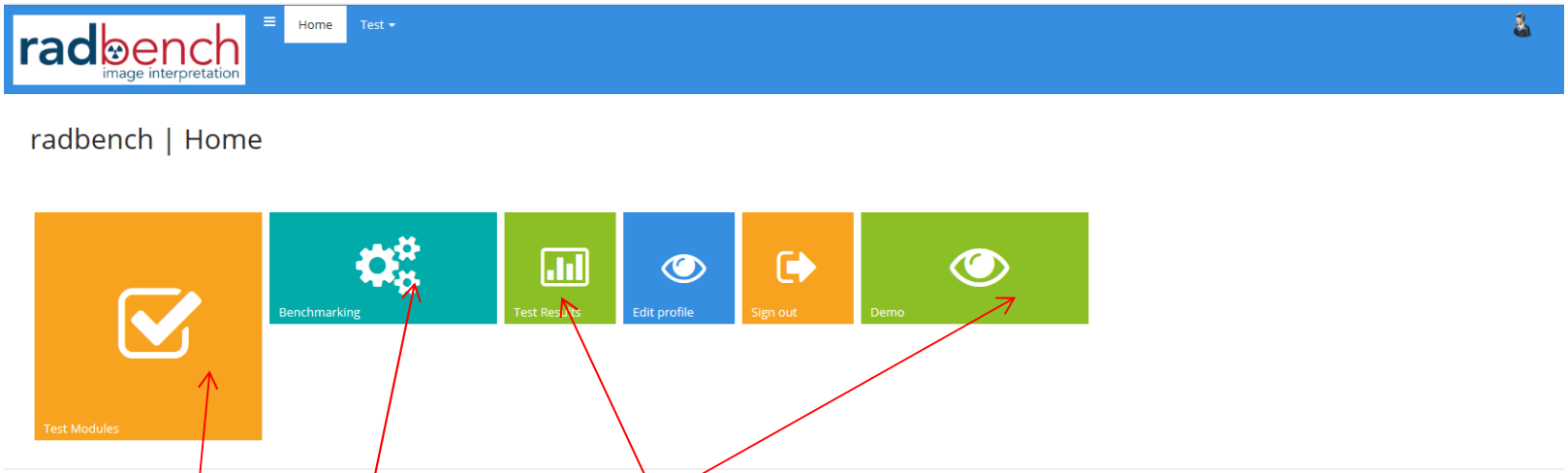
# Image Banks

- All images are blind double reported
- Both AP & Lateral projections are included as appropriate
- All images are ethically acquired and anonymised
- New image banks conform to FRCR (30 images)
- Older image banks have 20 images
- Any number or combination of normal/abnormal images can be built into a test (using the site licence)

# User Dashboard




The system is divided into two main areas : UCAS applicants (predominantly for Diagnostic Radiography and Medicine) and Healthcare Professionals.

Both look identical to the user (as above) but the content is very different.

A 'demo' area is provided such that users get a feel for the process.

A raft of 'test modules' are provided here, results and certificates here, and the ability to benchmark performance here

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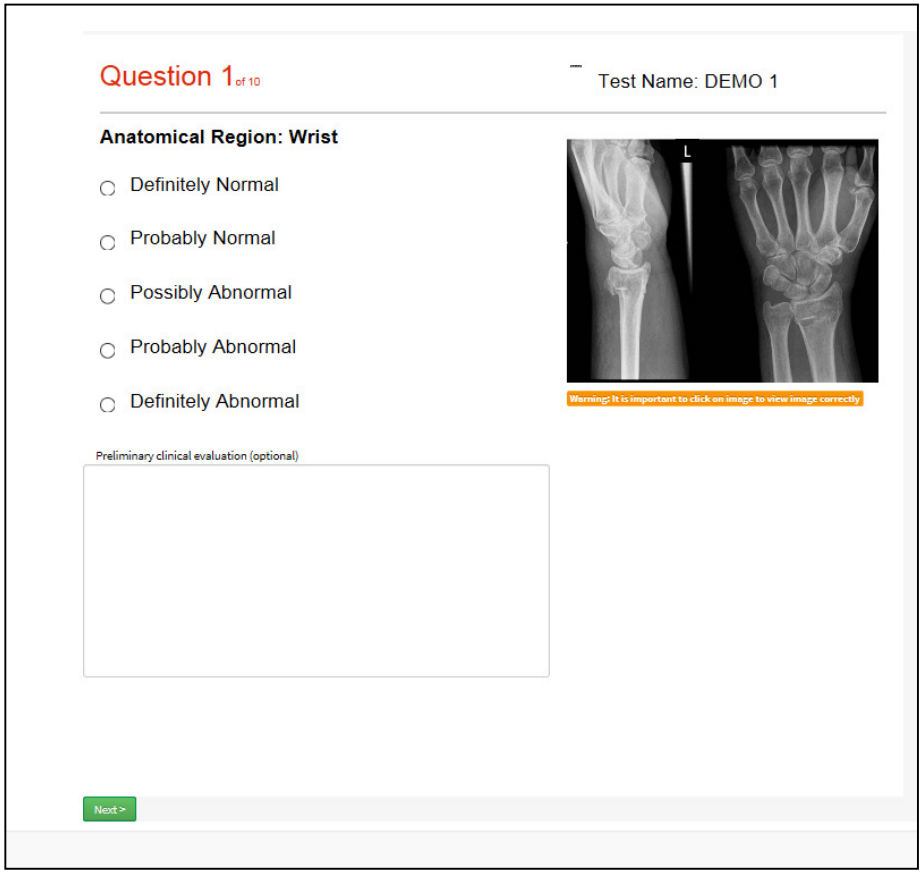
# User Test Interface





In all cases the user makes a selection of their chosen answer by clicking the circle, and preliminary clinical evaluation (optional), followed by 'next'.
At the final image the option to 'submit test' appears.
Results are then processed immediately, with the option to download a certificate.

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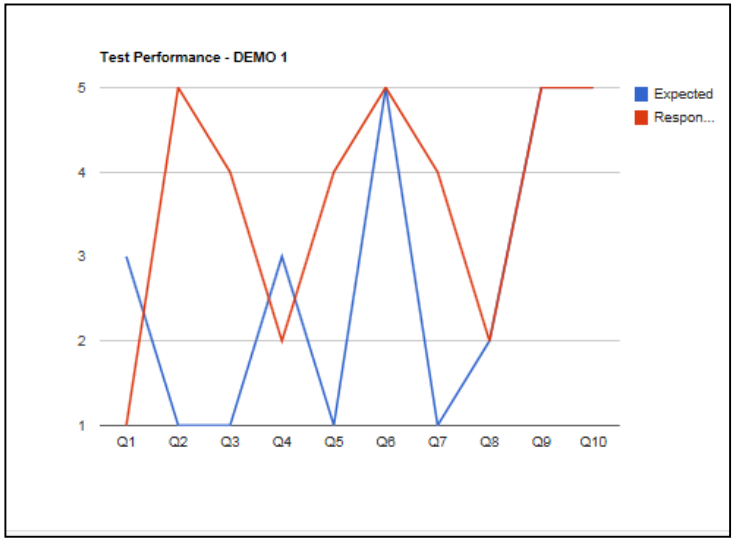
Learning Tools

Test Answer Details - DEMO 1

10 records per page  Search:

| Question | Anatomical Region | Your Comment | Official Report | Your Answer | Feedback |
|---|---|---|---|---|---|
| Q1 | Wrist | | Fracture | Definitely Normal | Error |
| Q10 | Thumb | | Fracture | Definitely Abnormal | Correct |
| Q2 | Ankle | | Normal | Definitely Abnormal | Error |
| Q3 | Foot | | Normal | Probably Abnormal | Error |
| Q4 | Foot | | Fracture | Probably Normal | Error |
| Q5 | Elbow | | Normal | Probably Abnormal | Error |
| Q6 | Elbow | | Fracture | Definitely Abnormal | Correct |
| Q7 | Wrist | | Normal | Probably Abnormal | Error |
| Q8 | Shoulder | | Normal | Probably Normal | Correct |
| Q9 | Ankle | | Fracture | Definitely Abnormal | Correct |
| Question | Anatomical Region | Your Comment | Official Report | Your Answer | Feedback |

Showing 1 to 10 of 10 entries  ← Previous 1 Next →




Graphical and written displays identify any errors and help define development needs.

Rationale is a scaffolding technique to firstly develop diagnostic accuracy and then improve decision making confidence.

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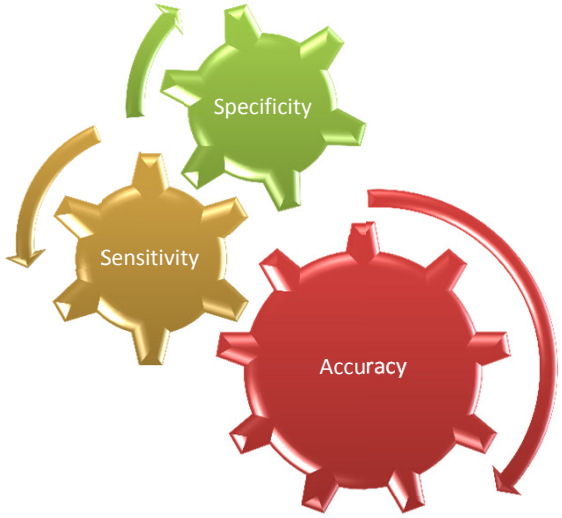
# Name Here

Completed the image interpretation assessment of MSK1.5




| Accuracy | Sensitivity | Specificity |
|---|---|---|
| 80% | 90% | 70% |

Date Here

Continuous Professional Education Certificate

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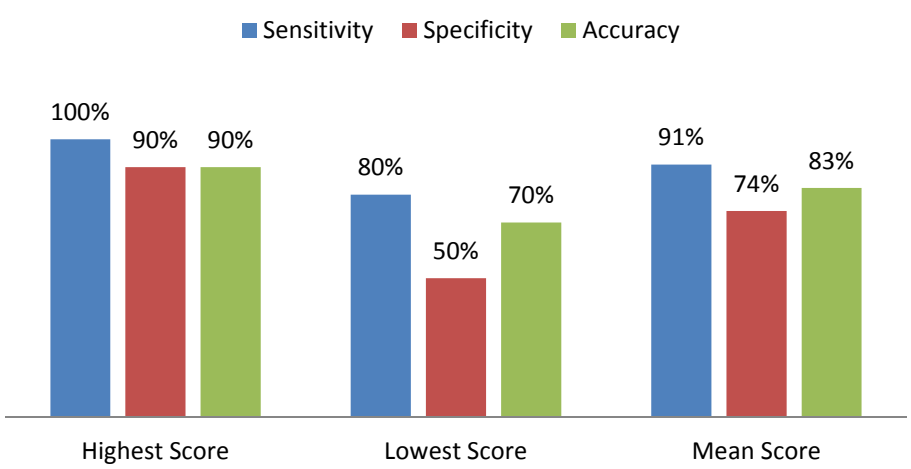
# Benchmarking

## Your Scores

| Accuracy | Sensitivity | Specificity |
|---|---|---|
| 85% | 80% | 90% |




A range of metrics are available to enable benchmarking at different levels e.g.

National
LETB
NHS Trust
Hospital
Category Defined

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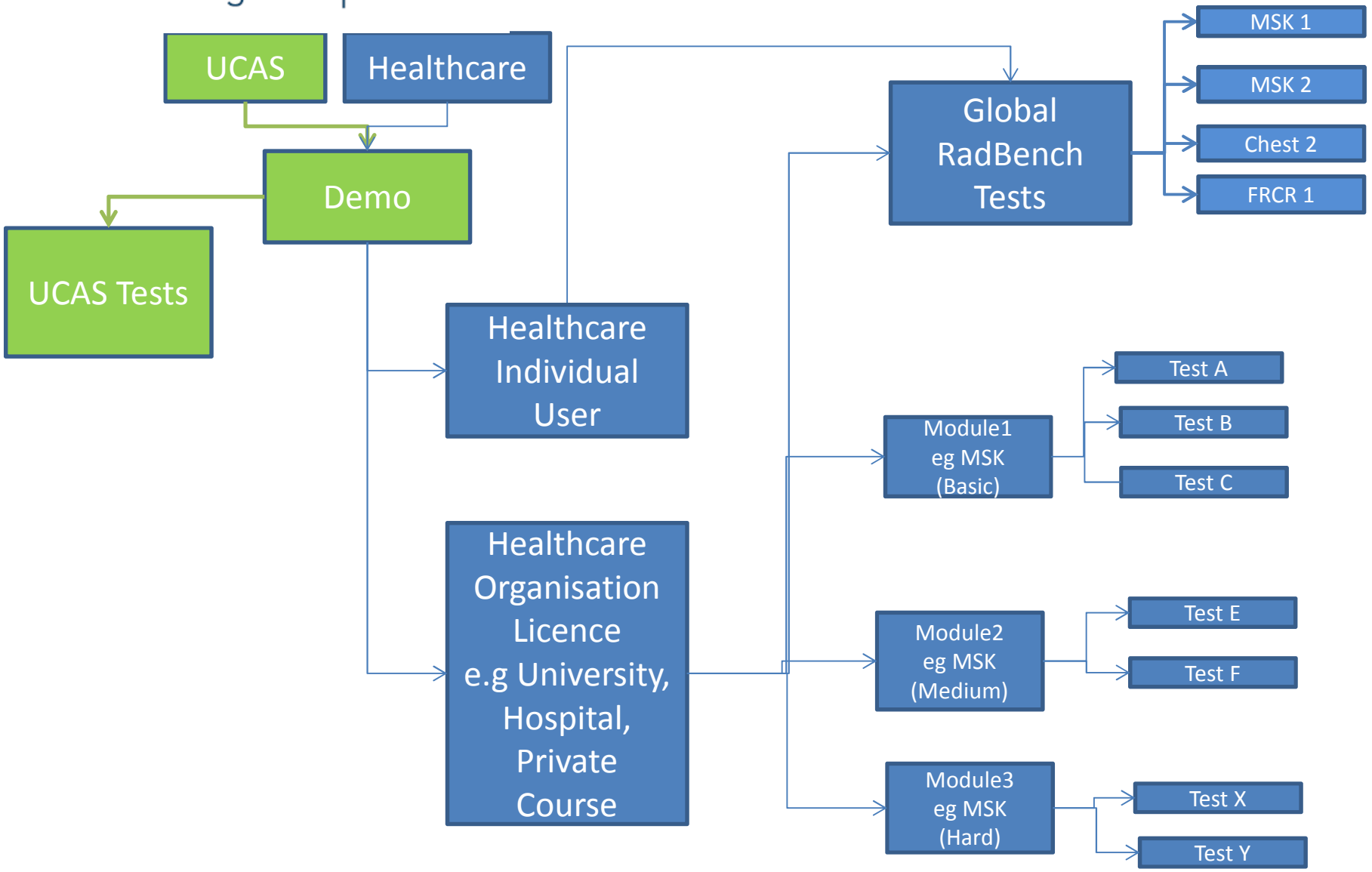
# Route 1: UCAS Applicant



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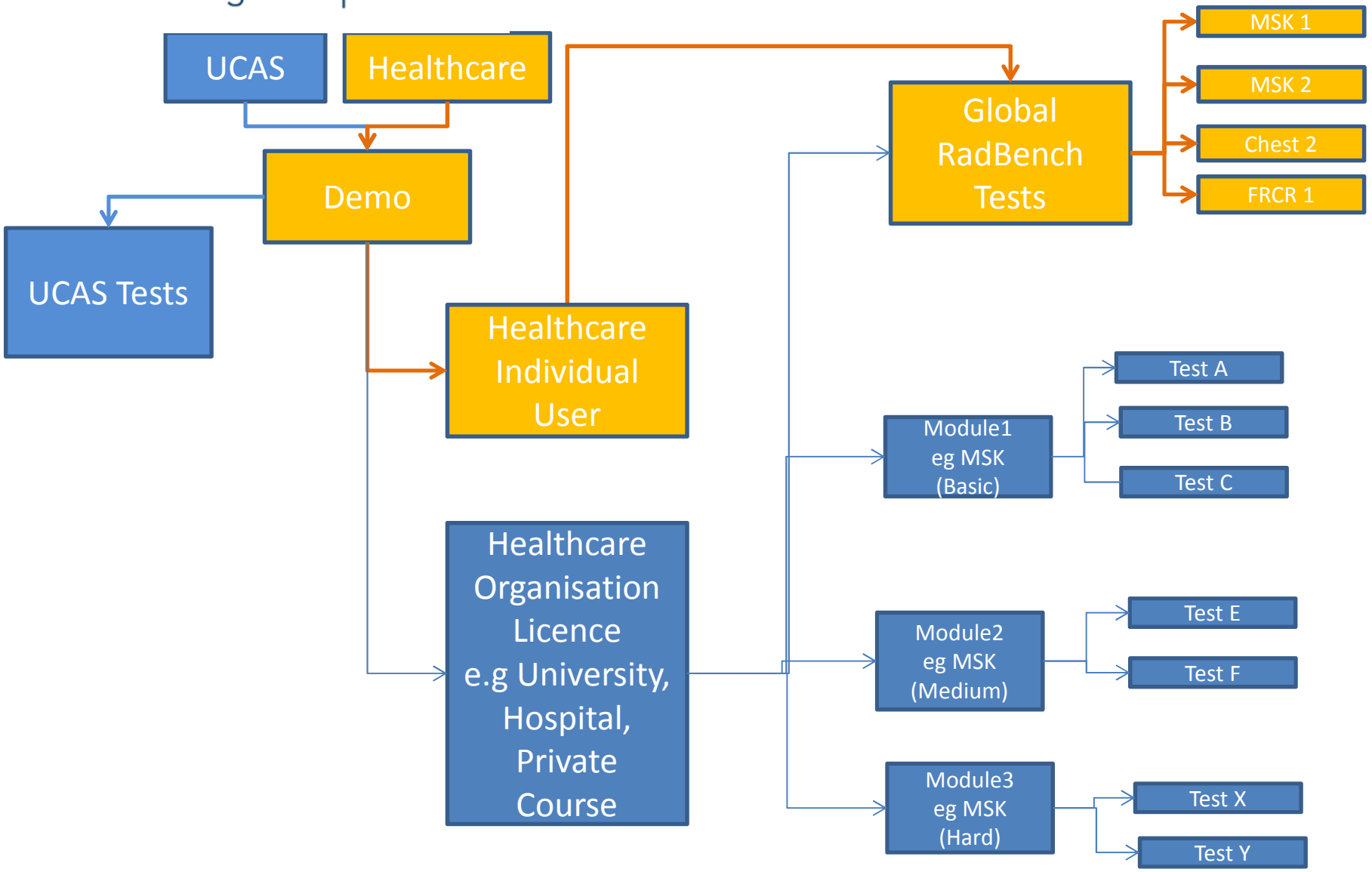
# Route 2: Healthcare Individual User



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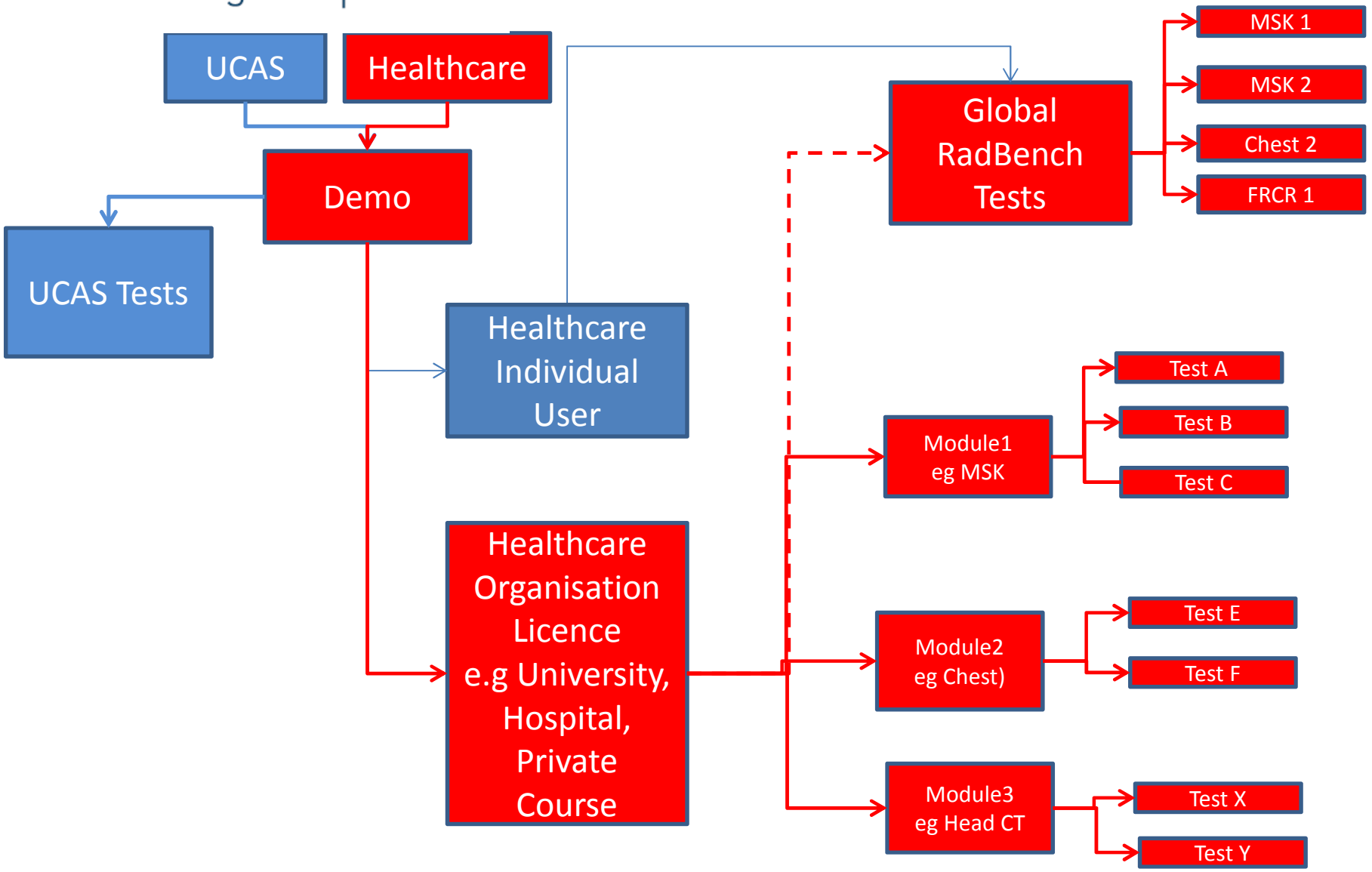
# Route 3: Organisation Site Licence



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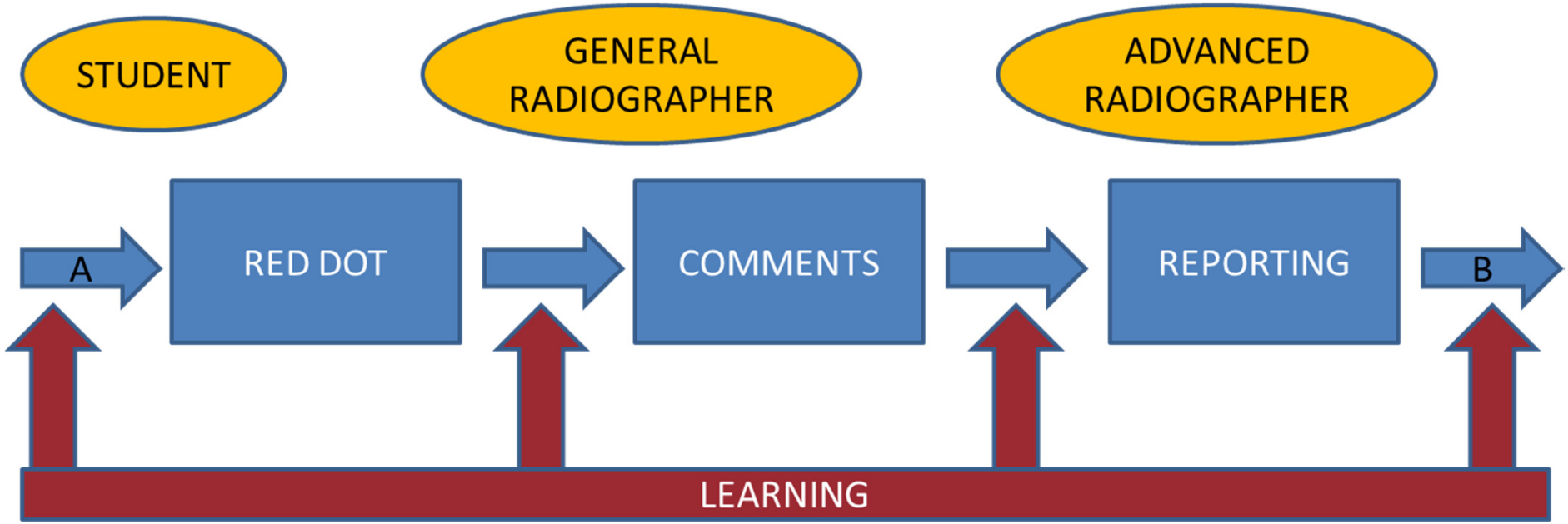
# Traditional Pathway




*Wright,C. (2012) 'RadBench: Benchmarking Image Interpretation Performance'. UKRC. June. Liverpool*

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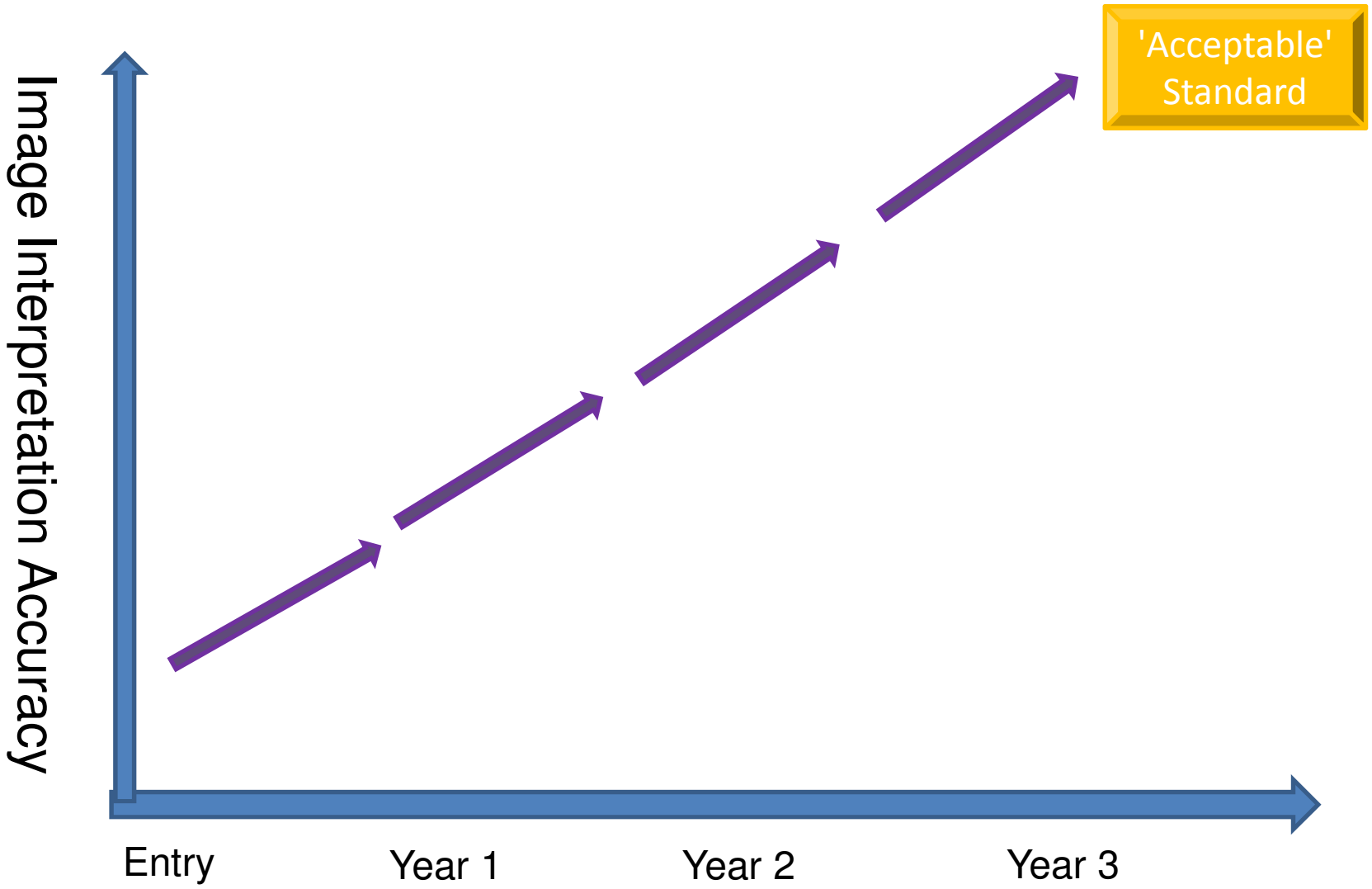
# Conceptual Progression Map



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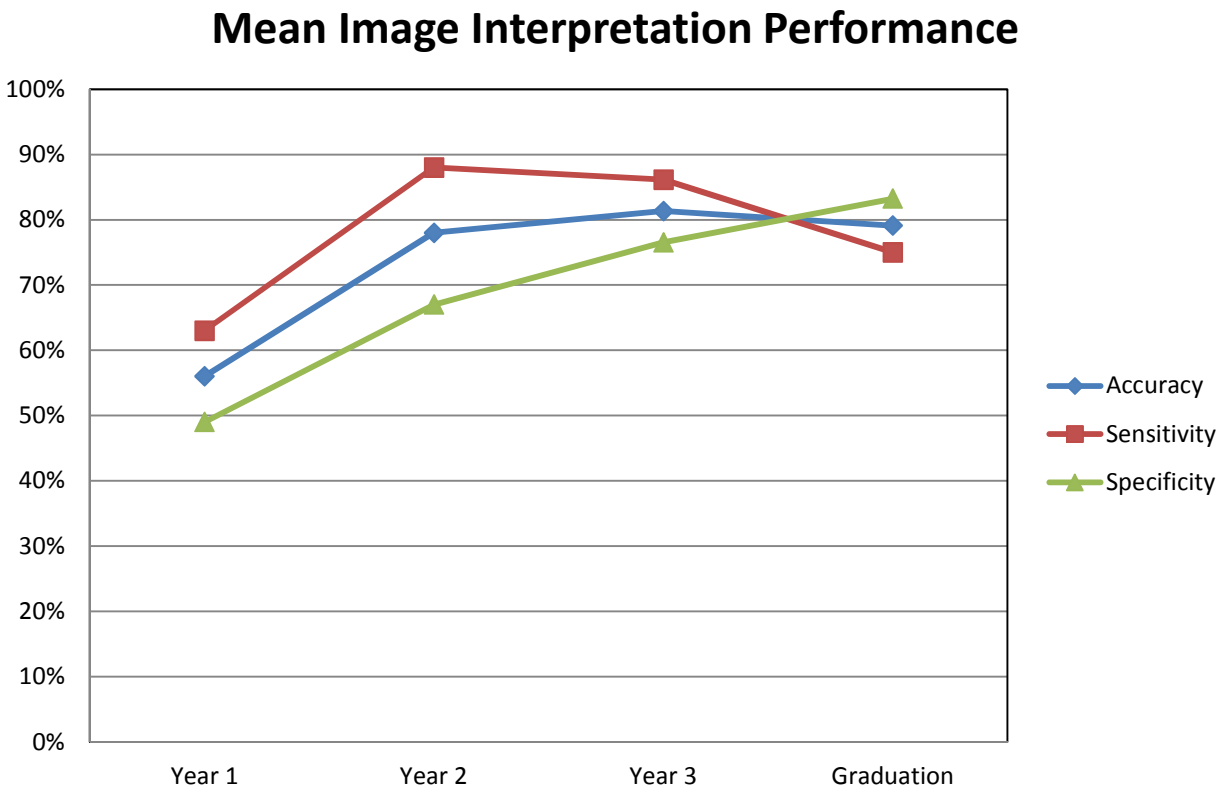
# Actual Progress Map




Novices are much better than one might expect! And skills grow very quickly!

Accuracy 'tail off' in year 3 is consistent with post short course effects as part of CPD

*Mackay S. (2006) The impact of a short course of study on the performance of radiographers when highlighting fractures on trauma radiographs: "the Red Dot System". Br J Radiol 2006;79:pp468-472.*

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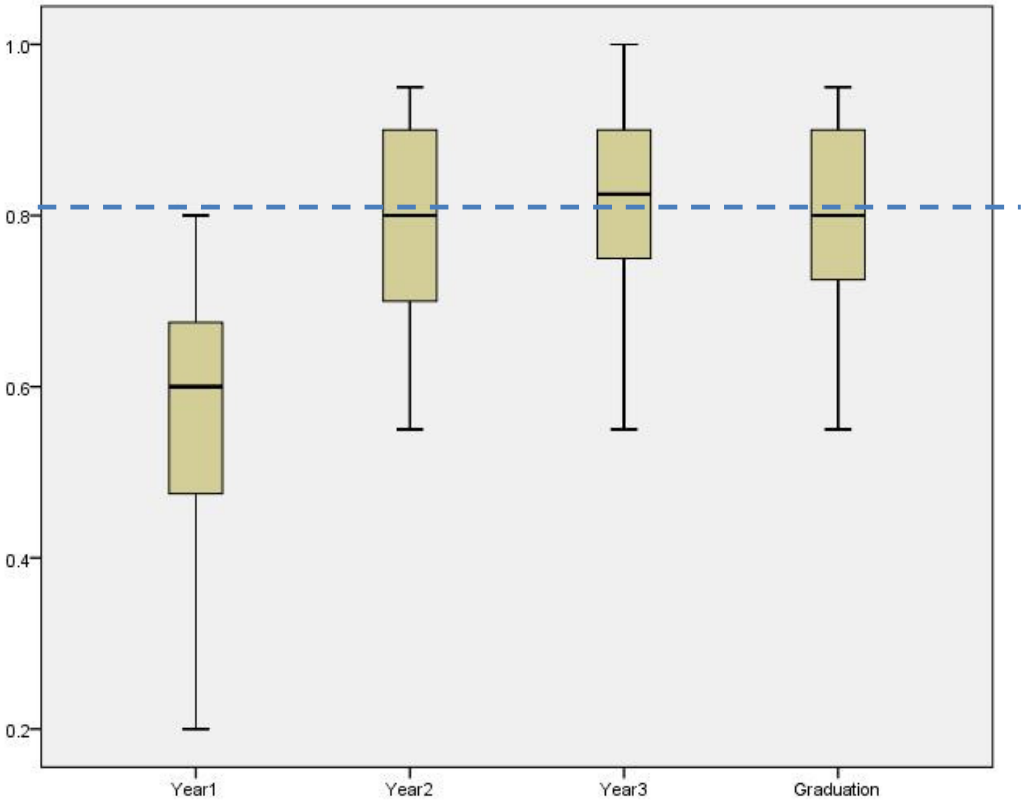
# Accuracy Box Plot




## 80% 'Minimum Expectation'

Brealey,S. (2001) 'Quality assurance in radiographic reporting: a proposed framework'. Radiography, 7, pp263–270

This evidence suggests that only 57% of new radiography graduates could potentially meet this 'minimum standard' which has implications for the College of radiographers (2013) policy and practice guidance.

*College of Radiographers (2013). 'Preliminary clinical evaluation and clinical reporting by radiographers: policy and practice guidance'. London*

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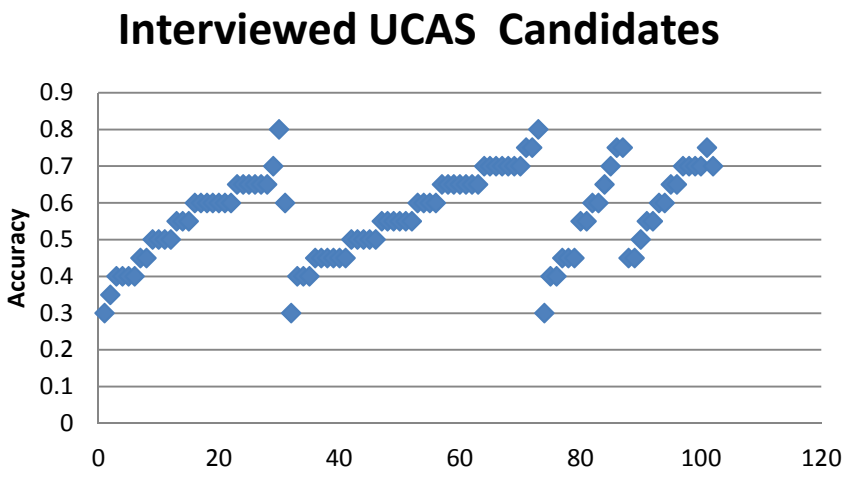
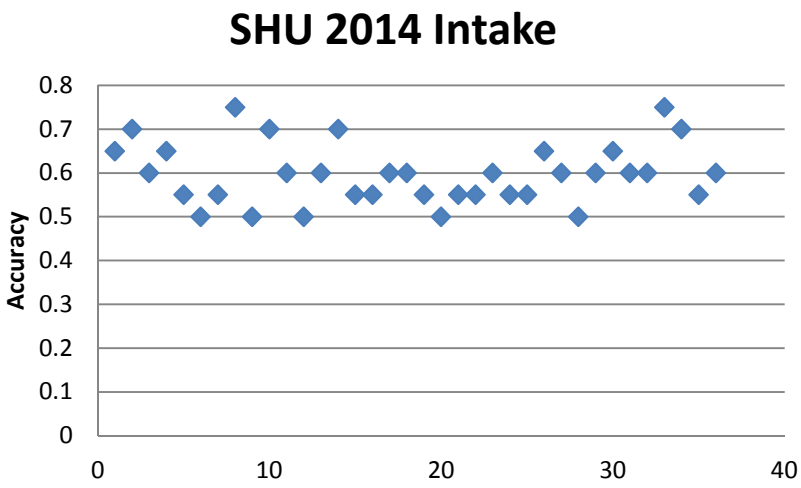
# Undergraduate Selection




RadBench is now routinely used as part of undergraduate selection in SHU.

Early indications suggest that entrants to University with a 'flipped profile' (low sensitivity (<40%) and higher specificity (>70%) also develop a weak clinical performance and seemingly will fail to develop into high calibre radiographers upon graduation, although further research is required to substantiate this finding (PhD project in progress now)

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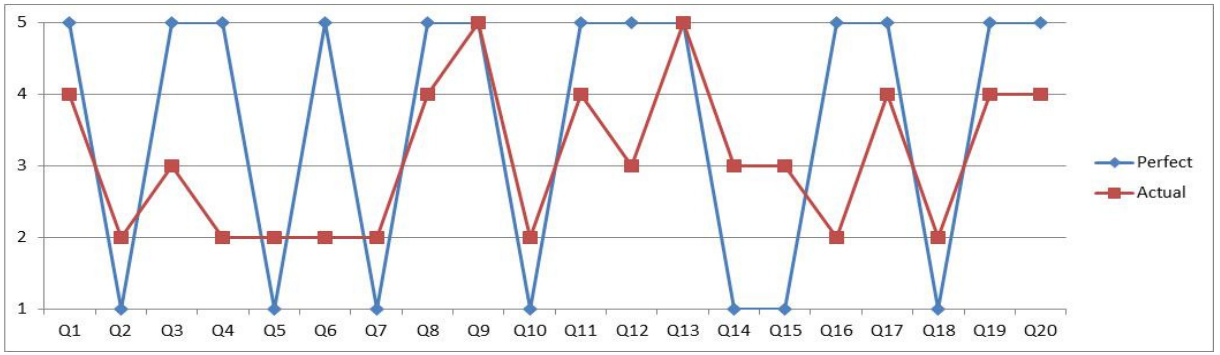
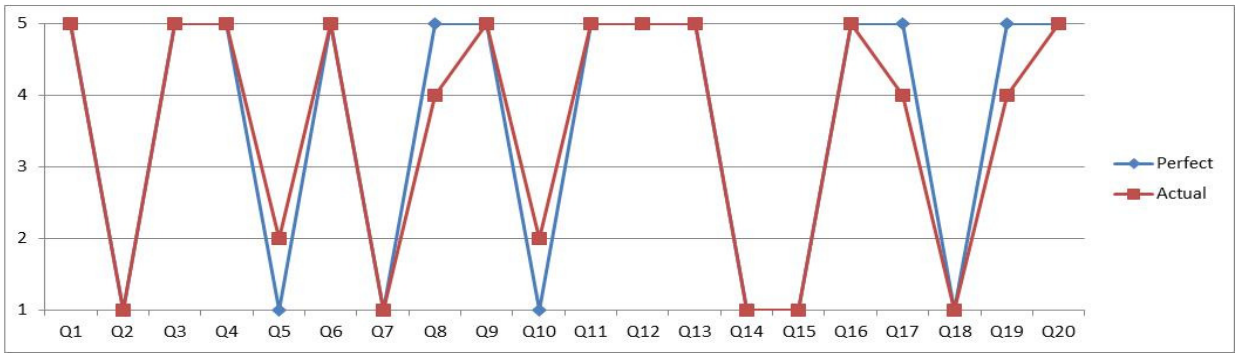
# Typical Decision Making Map




New Starter: Confidence in decision making is reflective of experience
Around 50% Accuracy




Graduate: Evidence of more confident decision making. >80% Accuracy.
Doesn't make bold decisions when unsure

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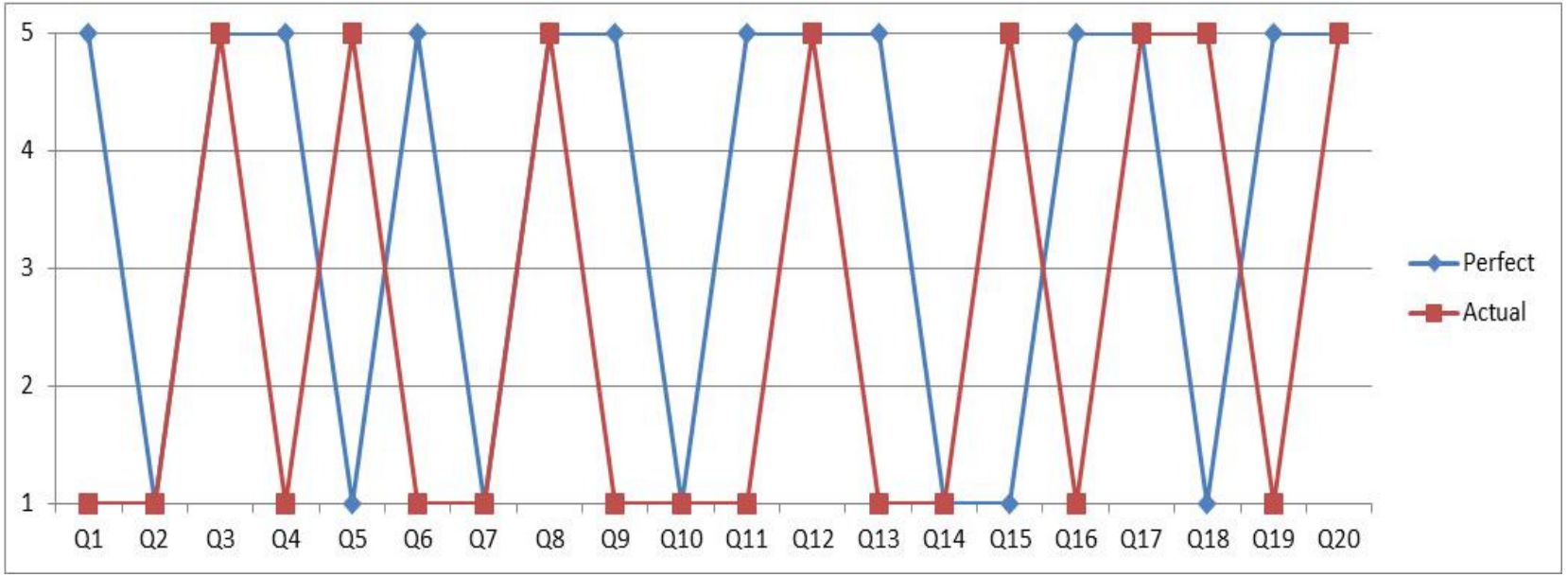
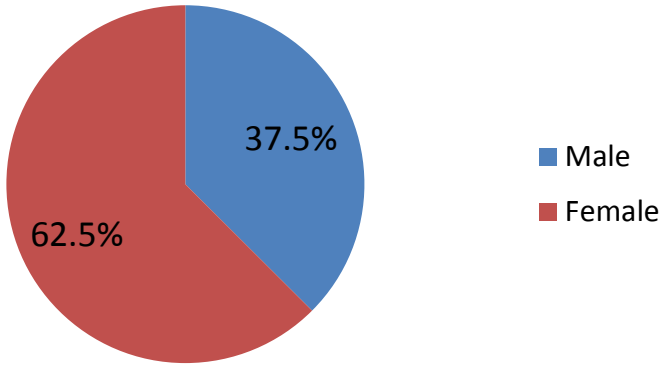
# The 'Maverick'

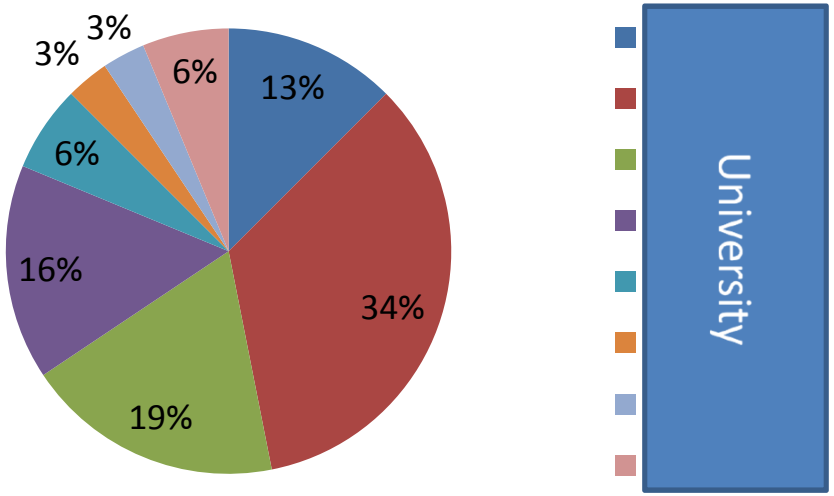



The ‘maverick’ profile presents a risk of unsafe practice in the qualified radiographer because they dominantly make definite only decisions, without the underpinning knowledge and inevitably make a high proportion of errors. If their opinion was valued by the referring doctor, this could have an adverse effect on patient treatment. Catchpole & McClumpha (2001) suggest that in the aviation security industry this profile could not be tolerated because it presents a serious risk to safety.

*Catchpole,K. & McClumpha,A. (2001) 'UK Threat Image Projection: Past, Present and Future'. Proceedings of the Third FAA International Aviation Security Technology Symposium, Atlantic City, November 27th-30th*

# NHS Hospital Example




Mean of TWO RadBench Tests was calculated per radiographer
(all working at least in part in 'General')

Only 69% of qualified radiographers (n=64) met the 'minimum' 80% standard which again has implications for the College of radiographers (2013) policy and practice guidance.

4 'mavericks' were identified

No statistically significant correlations could be found between performance and 'years of experience', 'gender', 'education profile', or 'age', however.....

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# Implications for Practice

- The evidence suggests a significant difference in competence depending on the training University

"Conclusion: Radiography education providers have embraced the need for image interpretation education within both pre- and post-registration radiography programmes. As a result, UK education programmes are able to meet the 2010 College of Radiographers aspiration"

*Hardy,M. & Snaith,B. (2009) Radiographer interpretation of trauma radiographs: Issues for radiography education providers. Radiography. 15. p101-105*

- Current evidence suggests that whilst all Universities include image interpretation as part of undergraduate training:

1) there is a difference in output quality

2) we don't actually know what the standard really is! *(PhD project in progress now)*

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# Implications for Practice

- Image banks vary in difficulty in a non-linear fashion (inter-test variability +/-8%)
  - Multiple tests provide a fairer performance estimation
- All radiographers were 'red dotting', some providing PCE
  - Unsafe practice? If their opinion was valued by the referring doctor, this could have an adverse effect on patient treatment
  - *Staff not meeting the 'minimum' standards should not practice in this area?*
- Focus groups with junior doctors suggest that the radiographers opinion is highly valued
  - Image interpretation now plays a minor role in Medical education.
  - Junior doctors in particular need help with diagnostics
  - If Radiographers don't do it, Nurses will!
- Occasional 'on-call' might be inadequate to maintain general image interpretation skills

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# Implications for Practice

- RadBench helps to identify training needs to focus CPD
  and monitor it's effectiveness

- The question for the profession

**'Should we have an auditable standard of image interpretation performance before radiographers are requested to perform Red Dot or PCE'?**

*as an update to the College of Radiographers (2013) policy*

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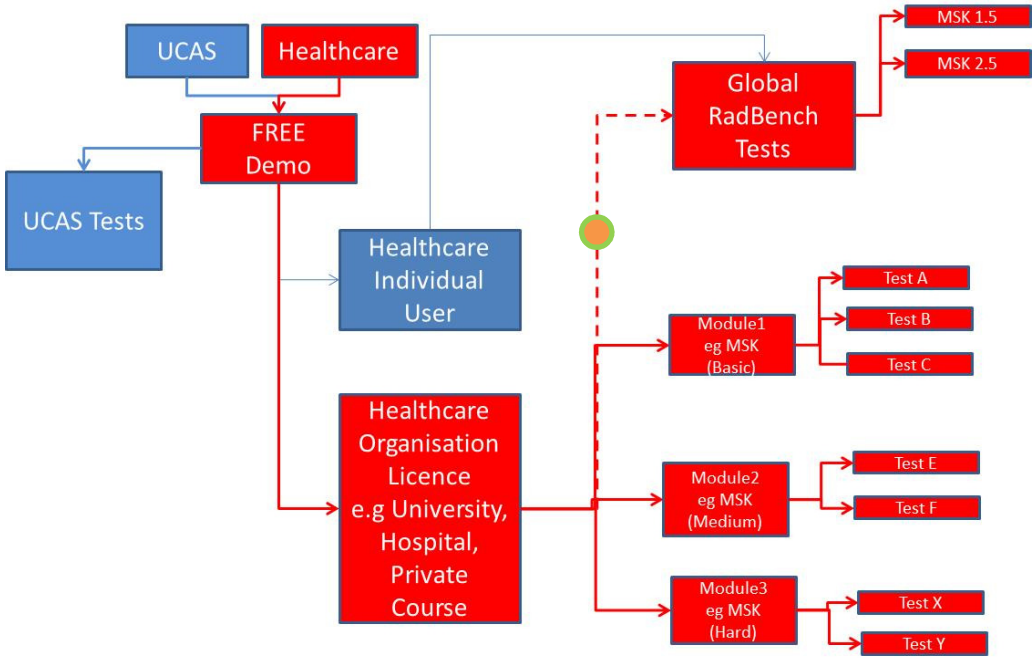
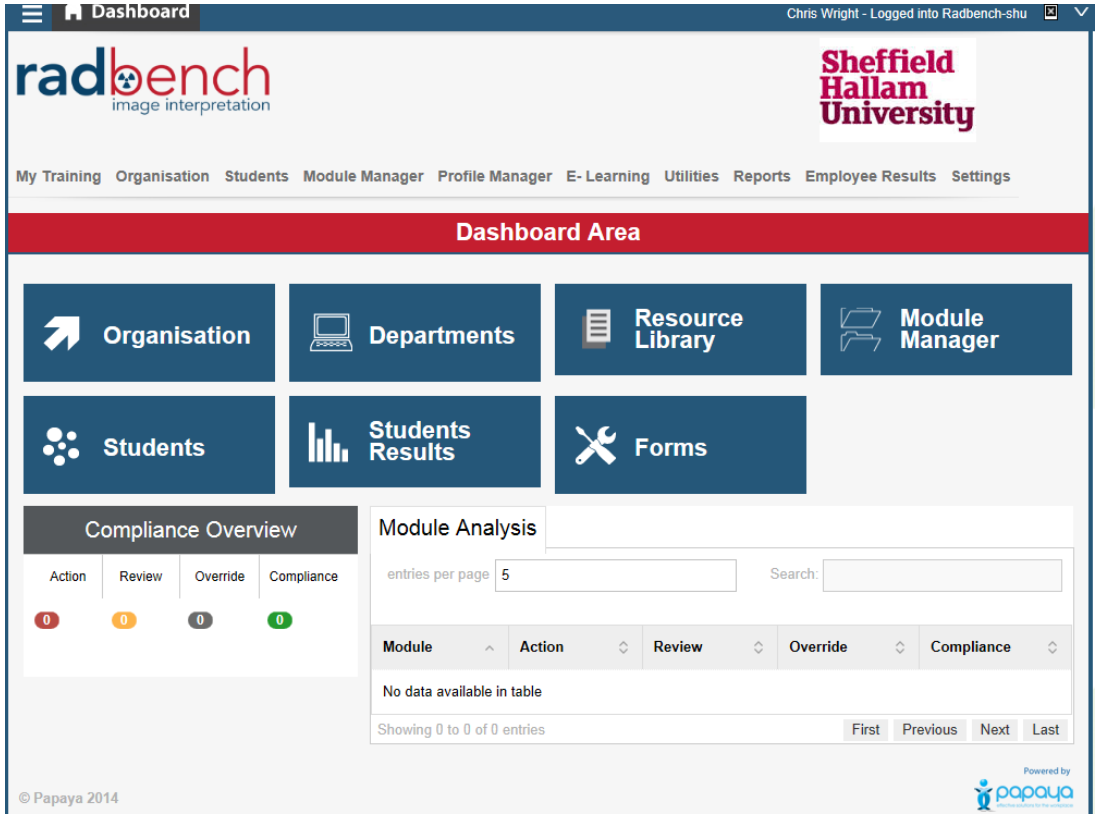
# Site Licence




- The site licence allows institutions to develop their own image banks and tests, **visible only to their specified users**
- Sharing the access to images (*controlled*) opens up the potential for a vast library
- The 'Global' RadBench tests enable any researcher to conduct a **large scale study**, which improves the reliability of findings

# Site Dashboard




*'Skin' can be customised to organisational requirements; logo, colours etc*

- **SECURE** site unique to the specific licence holder
- **Site Administrator** has full control of the content and application(s)
- A valuable resource for both **formative and summative assessment**

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# RadBench Applications

The main market drivers for adoption of the RadBench e-Learning platform are:

- Increase in non-radiologists doing image interpretation and commenting or reporting
- Improving patient care (quality agendas etc)
- Quality assurance for outsourced work as well as internal
- Student selection/aptitude testing
- Reducing litigation
- Increase in eLearning (e.g. due to budget and time constraints on healthcare providers + reduced radiological focus in undergraduate Medicine degrees)
- Enhancing personal credentials when applying for university positions or jobs
- Demonstration of CPD across jobs involving image interpretation

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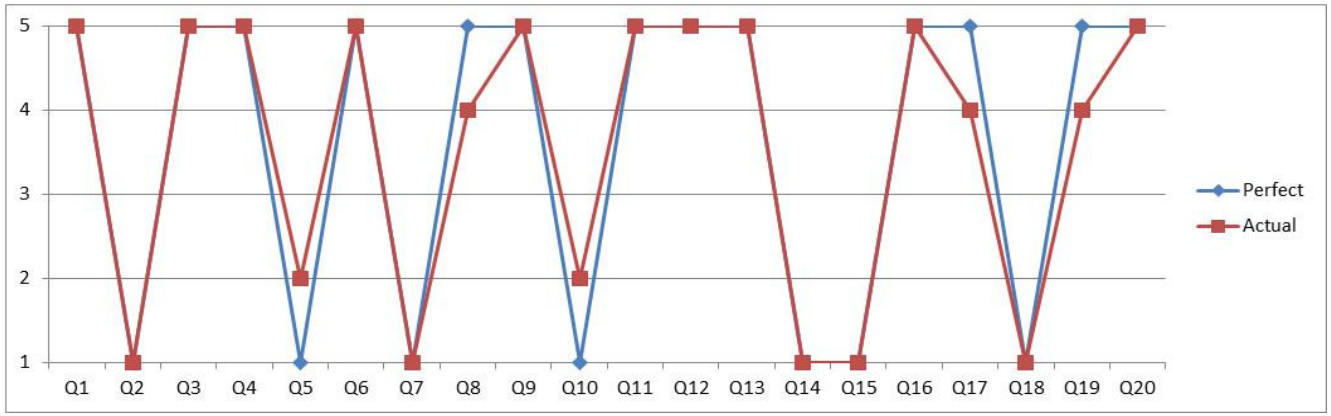
# Summary

- Discover and monitor individuals image interpretation performance
- Enable large scale GLOBAL benchmarking research
- Provide an audit platform for return on investment & quality
- Provide evidence to support role extension with safe practice
- Develop the resource for teaching and learning (unique site licence potential)

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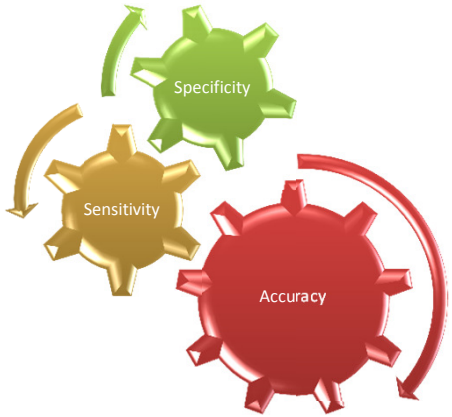


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